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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/697,771	10/29/2003	Yoyi Gong	JCLA11489	8870
7590 J.C. Patents, Inc. Suite 250 4 Venture Irvine, CA 92618			EXAMINER TRAN, LONG K	
			ART UNIT 2818	PAPER NUMBER

DATE MAILED: 10/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

<b>Office Action Summary</b>	<b>Application No.</b> 10/697,771	<b>Applicant(s)</b> GONG ET AL.	
	<b>Examiner</b> Long K. Tran	<b>Art Unit</b> 2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on October 14, 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1 - 9 is/are pending in the application.
- 4a) Of the above claim(s) 4 - 7 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3, 8 and 9 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)             | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date: _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date: _____  | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### *Election/Restrictions*

1. Applicant's election without traverse of Group I, claims **1 – 9** in the reply filed on August 08, 2005 is acknowledged.

2. Claims **10 – 11** have been cancelled.

3. In further review, this application contains claims **1 – 9** directed to the following patentably distinct species of the claimed invention:

**Species I**, drawn to claims **1, 2, 3, 8** and **9**, which claim the nitridation process comprises performing a furnace treatment.

**Species II**, drawn to claims **1, 4, 5, 8** and **9**, which claim the nitridation process comprises performing a rapid thermal treatment.

**Species III**, drawn to claims **1, 6, 7, 8** and **9**, which claim the nitridation process comprises performing a plasma process.

4. Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, claim 1 is generic.

Applicant is advised that a reply to this requirement must include an identification of the species that is elected consonant with this requirement, and a listing of all claims readable thereon, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

5. In addition, claims 2, 3, 4, 5, 6 and 7 link inventions I, II and III. The restriction requirement between the linked inventions is subject to the nonallowance of the linking claim 1. Upon the allowance of the linking claim(s), the restriction requirement as to the linked inventions shall be withdrawn and any claim(s) depending from or otherwise including all the limitations of the allowable linking claim(s) will be entitled to examination in the instant application. Applicant(s) are advised that if any such claim(s) depending from or including all the limitations of the allowable linking claim(s) is/are presented in a continuation or divisional application, the claims of the continuation or divisional application may be subject to provisional statutory and/or nonstatutory double patenting rejections over the claims of the instant application. Where a restriction requirement is withdrawn, the provisions of 35 U.S.C. 121 are no longer applicable. See *In re Ziegler*, 44 F.2d 1211, 1215, 170 USPQ 129, 131-32 (CCPA 1971). See also MPEP § 804.01.

Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over

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the prior art, the evidence or admission may be used in a rejection under 35

U.S.C. 103(a) of the other invention.

6. Applicant's election without traverse of Species I, claims 1 – 3, 8 and 9 in the reply filed on August 08, 2005 is acknowledged.

7. Claims 1 – 3, 8 and 9 are presented for examination.

***Claim Rejections - 35 USC § 102***

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Jenq (US Patent No. 6,204,146).

10. Regarding claim 1, Jenq discloses: a method of fabricating a shallow trench isolation (STI) structure, comprising steps of:

Providing a substrate 200 (not described; fig. 2A);

Forming a patterned mask layer 204 (fig. 2A; column 2, lines 58 – 65);

Patterning the substrate 200 using the mask layer 204 as an etching mask to form a trench 206 (fig. 2A; column 2, lines 65 – 67 and column 3, lines 1 – 2);

Performing nitridation process to form a silicon nitride liner 208 (figs. 2B and 2C; column 3, lines 3 – 20) on the surface of the trench 206; and

Depositing an insulating material 210 (fig. 2C; column 3, lines 21 – 25) over the trench and filling the trench with insulating material.

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11. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Liu et al. (US Patent No. 6,146,974).

12. Regarding claim 1, Liu discloses: a method of fabricating a shallow trench isolation (STI) structure, comprising steps of:

Providing a substrate 300 (not described; figs. 3A – 3C);

Forming a patterned mask layer 302 (figs. 3A – 3C);

Patterning the substrate 300 using the mask layer 302 as an etching mask to form a trench 304 (figs. 3A – 3C; column 3, lines 9 – 12);

Performing nitridation process to form a silicon nitride liner 306b (figs. 3A – 3C: column 3, lines 12 – 20) on the surface of the trench 304; and

Depositing an insulating material 308 (fig. 3C; column 3, lines 36 – 42; and column 4, lines 7 – 9) over the trench and filling the trench with insulating material.

### ***Claim Rejections - 35 USC § 103***

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jenq (US Patent No. 6,204,146) in view of to Lin et al. (US Patent Application Publication No. 2004/0082200).

15. Regarding claim 2, Jenq discloses the claimed invention of claim 1 except for the nitridation process comprises performing a furnace treatment.

However, using furnace treatment or rapid thermal nitridation (RTD) process for forming silicon nitride layer in nitridation process is a conventional thermal nitridation as shown by Lin et al. (silicon nitride layer 12; fig. 1; [0009] and [0010]).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to employ a conventional thermal nitridation process such as furnace treatment instead of RTD process to form a silicon nitride liner, since it has been held to be within the general skill of a worker in the art to select a known conventional process on the basis of its suitability for the particular application and/or the availability of equipments.

Regarding claim 3, as reasons given above, Lin further shows the nitridation process performing a furnace treatment carried out in an atmosphere of gaseous nitrogen ([0009] and [0010]).

16. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al. (US Patent No. 6,146,974) in view of Wu et al. (US Patent No. 6,569,731).

17. Regarding claim 8, Liu discloses the claim invention of claim 1 except for the formation of the liner oxide layer and the nitridation process for forming the silicon nitride liner are performed in-situ.

However, Wu shows a method of using "a nitridation process with  $N_2O$  as reactive gas is performed in-situ to form a nitridation layer 42 on the oxide layer 40 as shown in FIG. 2D" in the trench 32 (fig. 2D; column 3, lines 35 – 36).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to perform the formation of the liner oxide layer and the nitridation process for forming the silicon nitride liner of Liu in-situ as shown by Wu in order to decrease the pinhole density (column 2, line 10) and to reduce both cycle time and process costs (column 3, line 67 and column 4, lines 1 – 2).

Regarding claim 9, as reasons given above, Wu further shows a step of forming the liner oxide layer 40 comprises performing a thermal oxidation and integrating the thermal oxidation process with the nitridation process by introducing gaseous nitrogen mid-way through the thermal treatment (column 3, lines 29 – 43).

### ***Conclusion***

18. A shortened statutory period for response to this action is set to expire e (three) months and 0 (zero) day from the date of this letter. Failure to respond within the period for response will cause the application to become abandoned (see MPEP 710.02 (b)). Any inquiry concerning this communication or earlier communications from the examiner should be directed to Long K. Tran whose telephone number is 571-272-1797. The examiner can normally be reached on Mon-Thu.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on 571-272-1787. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

LKT

October 19, 2005

A handwritten signature in black ink, appearing to read "USTRM", with a long horizontal line extending to the right.